

The Tribune Radio News of the Air routes By Jack Binns

Amateur System Extended to Porto Rico

Latest Success by American Radio Relay League of Its Countrywide System Emphasizes Efficiency

All Done With Low Power

Hope Soon To Be Able To Talk With South America, Then With South Africa

Night by night, throughout the breadth of the land, there takes place a series of communications under the most efficient organization ever produced by voluntary methods. The development and operation of this system is the work of the American Radio Relay League, under the executive guidance of its national institution—the American Radio Relay League.

The work of this organization has to do with the extension of the phenomenal advance of public interest in radio due to the advent of broadcasting, and only occasionally does it include the achievements of the amateur radio operators. Under the circumstances, therefore, an outline of its operation will be timely, particularly in view of its latest success.

Before outlining this, however, it should be pointed out that the amateur radio operator is not a person owning a transmitting station; he is restricted to a maximum output of one kilowatt of power by the government. Many of the restrictions imposed by the government are still further restricted by the exigencies of their financial standing, but they make up in enthusiasm what they lack in funds.

Must Not Exceed 200 Meters

To still further understand the contribution of the amateur radio operator to the development of radio as a means of communication it should be stated that he is also compelled to work on a wavelength of 200 meters or longer, where the frequency of the oscillating current is so tremendously high that it offers almost insurmountable difficulties.

Despite these obstacles, he has succeeded in communicating across the Atlantic Ocean with less than one kilowatt of power, under the same conditions the big trans-Atlantic wireless stations are required to use 200 kilowatts. This is unquestionably his crowning triumph.

Day by day he maintains a network of communication across the country which has already proved its worth in cases of emergency and which is becoming more efficient every day. In addition he also maintains a daily communication between the Pacific Coast and the Hawaiian Islands, and has even powered him by the government.

Communicates With Porto Rico

Now his latest triumph comes with the establishment of communication between this country and Porto Rico. His successes have so impressed the British government that the authorities in London have lowered the rigid bars for British amateurs and a two-way trans-Atlantic test will be tried in December for the first time.

Not content with this, the American Radio Relay League is considering the possibility of extending its service to South Africa by way of the West Indies and the Hawaiian Islands. The possibility of world-wide amateur communication looms larger every day.

The important thing in the development of this remarkable system is the efficiency that has been attained under the rigid restrictions imposed by the government. Necessity has been the mother of invention with the amateur, and as a result of the restrictions some of the most important radio inventions have been made by amateurs. These reflect themselves in the more important international wireless communication systems.

The first success of the league is contained in the following report, which F. H. Schnell, traffic manager of the league, sends me:

First Message From Porto Rico

"For the first time in the history of amateur radio, members of the American Radio Relay League are in communication with their members in Porto Rico. The first message to reach the mainland was addressed to the American Radio Relay League, and was received by Mr. Schnell at 4:47 P. M., and finally to 10 P. M. J. L. Reinartz, South Manchester, Conn. The message was started Tuesday night, October 27, and received by Mr. Schnell Wednesday night. The message read as follows:

"San Juan, P. R., Sept. 19, 1922. Ck 12.

"American Radio Relay League, Hartford, Conn.

"First radio greetings to the A. R. R. L. from the amateurs of Porto Rico. We are now in communication with you."

"The Porto Rico Radio Club is an affiliated society of the A. R. R. L., and for some time an effort has been made to work the mainland, since the amateurs of Porto Rico have been able to receive our stations during the trans-Atlantic tests."

"League members are being invited to accept messages for Porto Rico beginning at once, as regular communication will be maintained whenever the weather permits."

"The Hiram Percy Maxim, president of the American Radio Relay League, was highly enthusiastic on learning of the receipt of this message, and said that, in his opinion, it marks the advance of the amateur radio operator toward the southern hemisphere, and he believes that before long Porto Rico amateurs will be communicating with amateurs in Central America and Brazil, and when this comes about there is every reason to believe that communication via the American Radio Relay League will be established with English-speaking peoples in South Africa."

Army Has Radio Course For Recruits In Air Service

A new army radio school for training air service radio operators and technicians has been established at Chanute Field, Ill. The school was removed from Post Field, Okla., and new classes for radio instruction are being formed. It will be equipped with all the latest radio devices, including apparatus for aerial work, and will be the most modern in the air. Enlistments for training in radio for the army air service are now being accepted at Chanute Field, where a six months' course will start within a few weeks.

Radio Congress in France

A congress was opened a few days ago at Marseilles Colonial Exhibition to discuss matters relating to wireless telegraphy in France and her colonies, and the colonies among themselves.

Report of Tribune Institute Radio Laboratory for Week

Experiments With Simplified Super-Regenerative Practically Complete; Sets Tested Include a Two-Stage Radio Frequency Receiver

During the week the experimental work carried on at the Tribune Institute Radio Laboratory consisted of tests conducted with the Armstrong super-regenerative circuit for the purpose of reducing the tuning elements in number. The theory of the three-tube set is practically completed, and a detailed description of this set will be given in next Sunday's paper.

A new set has been conducted with the single-tube circuit, wherein honeycomb coils are used throughout. By taking advantage of the construction of the regular three-coil mounting it has been possible to design a set which is very compact in appearance. This set also will be described in detail.

The testing of apparatus was continued, and a complete set using radio frequency amplifier and tuning circuit approved. The following is a brief description of the laboratory so far as this phase of its work is concerned. All the apparatus described below has been prepared.

Novel Locking Device for Rheostat; Also Receiver

This is a device which has been adapted to filament rheostat and filament circuit switch for the purpose of protecting the tubes against tampering fingers. Unless a special key is used with each lock is inserted in the holes at the end of the filament circuit, the knob will have no effect on the mechanism which it is supposed to control.

The filament circuit switch consists of a proper contact screwed to a movable shaft in such a way that movement through 45 degrees throws the filament circuit on or off.

A point indicator of the position of the switch arm is determined, must be parallel to the arm before the key will enter the key receptacle sufficiently to lock the switch. This switch must be mounted upon a panel with small rectangular insulative block supporting the contacts on the inside and on the outside.

This same type of lock has been adapted to filament rheostat control, so that there is no danger of any one without a key sending excessive current through the filament. This switch shortens the life of this control, but is a very delicate element. Or, with the key in place, the operator may turn the filament rheostat all the way in, and leave the filament circuit on, and the filament will not be changed, unless by somebody possessing the means of locking the knob. It is practically impossible to tamper with, despite its simplicity. Made by Joseph Rosen & Co., Irvington, N. J.

Single, Double and Triple Sockets on Composition

These sockets come in the single, double and triple mounts, ready for mounting. The socket sleeves are of nickel-plated brass, and are of a block of black composition three-eighths of an inch thick.

Two parallel grooves running the length of the under side of the block carry the filament and the filament with the tube terminals. The binding posts consist of nickel-plated brass bolts, which perform the double function of holding the bolts in place and securing the leads. Nuts are used to secure the connections at the terminals, in place of the usual thumb screw.

Complete Receiving Set With Two Stage R. F. Amplifiers

This set consists of two stages of radio-frequency amplification, detector and two stages of audio amplification, being used on loop for average distance reception.

The 23-plate condenser comprises the tuning element for the conductivity coupled circuit, and a jack is provided for plugging in the loop. A potentiometer is also used to control the potential of grids in both radio-frequency stages, and is, of course, essential for successful operation.

In the filament circuit of the detector, a rheostat is inserted to facilitate maximum efficiency, while in the filament circuit of each of the other two tubes automatic filament current control plugs are used to maintain a constant current flow. The front panel of polished black composition is inset in the grooved sides and bottom of the cabinet, and may be removed by unscrewing a grooved strip across the top and lifting the panel upward.

Since the entire apparatus and wiring is fastened to this front composition plate, the whole interior is thereby conveniently revealed for inspection.

An insulative shield, 4 inches wide by 12 1/2 inches long, is fastened to the rear of the panel, 3 1/2 inches from the cabinet bottom, by heavy cast brass angle braces. Upon this shield are the five aluminum sleeved, black composition based sockets.

The two small radio-frequency transformers, with windings contained in black cylindrical cases, about the size of a tube socket and less than one inch high and the two audio-frequency transformers with rectangular, laminated, closed cores, surround the primary and secondary windings.

A three-inch dial in the left upper corner indicates the position of the condenser in the input circuit. Directly below this are the five terminals for the "B" battery connection.

Very satisfactory results were obtained in the reception of local broadcast stations when using this set in conjunction with a loop having eight turns and measuring thirty-three inches along the side. The principal difficulty is in tuning, which requires a very delicate adjustment of the potentiometer for the best results. In spite of the fact that the testing was carried out in a well-shielded building, the signals were sufficiently strong to be satisfactorily reproduced in a loud speaker. Made by Victor Electric Testing Company, New York.

Special Rheostat Designed for Power Tube Amplifiers

This rheostat is designed to carry a heavier current than that of the ordinary type. The resistance wire, wound upon a non-combustible strip and imbedded in a disk of black asbestos composition, has approximately twice the current carrying capacity of the 5-watt type.

The disk upon which the resistance is mounted is designed to be fastened to the rear of front panel, and a knurled knob with pointer is attached. The resistance wire is wound in an integral extends through to the spring contact arm at the rear. If, when assembled, this arm is pressed securely in place before the set screw is tightened upon the shaft, good, firm contact may be secured.

Connection is made to two nickel-plated brass studs at the rear, having small round head screws set into their ends. The disk upon which the rheostat is mounted measures 2 inches in diameter and is 3/4 inch thick. The control knob is of black composition and milled for ease of manipulation.

The total resistance of the rheostat is 1.5 ohms. Made by Frank A. D. Andrea, New York City.

Plotron Vacuum Tubes Are Suitable as Amplifiers

This 5-watt power tube gives very satisfactory results when used in certain special cases requiring considerable amplification. It will stand considerably more voltage on the plate than the average amplifying tube on the market.

These tubes were used quite successfully in the amplifying stage of the three-tube super-regenerative circuit introduced by Armstrong. Made by Triad Corporation, New York City.

Regulation Receiving Tube Rheostat Similar in Design

The receiving tube rheostat is of the same general design as the power tube type, with the exception that 24 gauge wire is used in place of 20 gauge wire in the power tube.

Since the resistance of this tube is 6 ohms, the filament current for the receiving tube. Made by Frank A. D. Andrea, New York City.

Standard 22 1/2 Volt "B" Battery With Variable Taps

This is a 22 1/2 volt battery of standard dimensions, 6 1/2 inches by 4 inches by 3 inches, having brass thumb screw type variable taps at 10, 15, 20, 21 and 22 1/2 volts.

The battery is sturdily constructed and gave satisfactory results from the standpoint of long life and constant current supply. Made by Voltron Battery Company, New York City.

Fan "Burns Up" Country Road To Get Juice for Radio Set

A long spin on his motorcycle is necessary for Stanley E. Schabel, of Allentown, Pa., every time he wants to listen-in on his radio set. In a recent test to WGY, the radio broadcast station at Schenectady, N. Y., Mr. Schabel, who is the Associated Press operator for "The Chronicle and News," states that he uses his motorcycle every time the battery gets weak.

Elusive Action Of Negative Resistance

Term Made Prominent by Invention of the Super-Regenerative Circuit Explained by Analogy Condition Reversed in V. T.

Resistance More Important in Radio Sets Than It Is in Electric Circuits

By Ralph K. Potter
Tribune Institute Engineer

Super-regeneration has introduced a number of new terms for the radio enthusiast to struggle with. Among these is "negative resistance," which plays an important part in the proper operation of Major Armstrong's latest radio receiver.

Resistance of a substance, as ordinarily met with in electric circuits, is a measure of its ability to obstruct current flow. Thus we consider a pencil line along a strip of cardboard (as used for a grid leak) to have a very high resistance because a relatively high voltage is required to make it flow. The result is the flow of only an extremely small current.

A resistance of this type is measured in megohms, or millions of ohms, while that of a piece of copper wire the same length might be only a thousandth part of an ohm or less. In an electrical lighting system, a resistance with resistance that are measurable in megohms fall in the class of insulators, but in radio they may perform a very important function in the conducting circuit. A very large such resistance, as a megohm resistance would have been classed among the "high-voltage" devices of thick-spectacled scientists by the majority of us who to-day find enjoyment in straining muscle out of the air.

Water Pipe Analogy

Any enthusiast with enough pioneering spirit to "roll his own" in the way of a vacuum tube receiving set, will find it necessary to use the term "megohm" in his radio vocabulary. Applying the hydraulic analogy to resistance, a long line of pipe carrying water under pressure, and the delivery at the other end, is equivalent to the internal resistance of this pipe. The flow will be limited by the pump pressure at the source—and the higher the pump pressure the more water will flow. Ordinary resistance in electrical conductors acts similarly—that is, the more electrical pressure in volts there is, the more current will flow. The greater will be the current flow.

There is, however, another type of resistance that falls somewhat behind the range of ordinary resistance, and is known as negative resistance and it is particularly important in the action of the vacuum tube. When the tube filament is energized and a positive potential is impressed upon the plate (by attaching the "B" battery across from filament to plate) there is a flow of negative charges or electrons across the tube. A variation of this electron flow is produced by the varying charge on the grid between the two—negative charge on the grid retarding the flow of electrons, and a positive charge assisting them in their movement.

Reversed Conditions

Contrary to experience with ordinary resistances, in which current increases with increase in potential, the reversed condition of negative resistance circuit vary in the opposite direction, the potential actually decreasing as the current flow increases. Due to this reversal of the usual flow problem, the term "negative" has been prefixed as a means of designation.

To overcome resistance requires an expenditure of energy, whether considered from the electrical or mechanical point of view. Dragging a sled on the bare pavement will convince most of us of the mechanical application. Once electrical resistance is exemplified as the light bulb that radiates the energy used up in overcoming its resistance in the form of light and heat, it is not difficult to see why a vacuum tube, as heat dissipating energy largely as heat alone, is considered from the electrical or mechanical point of view. Dragging a sled on the bare pavement will convince most of us of the mechanical application. Once electrical resistance is exemplified as the light bulb that radiates the energy used up in overcoming its resistance in the form of light and heat, it is not difficult to see why a vacuum tube, as heat dissipating energy largely as heat alone, is considered from the electrical or mechanical point of view.

Negative Resistance Explained

These illustrate the so-called positive resistance circuits. Now if it is possible to put on a positive resistance type as was being radiated from it the system would, according to electrical measurements, have no resistance at all. Have an 8-volt battery use 6 volts on first two tubes, with a separate wire running from fourth cell of rheostat of third tube to the filament of the first tube. This resistance is as shown in your diagram.

Answer—I take it for granted that the connections in your set are perfectly O. K. The fact that you have joined the two ends of your primary variator coupling, and to the two switches is perfectly all right, as that connection acts as a dead-end switch arrangement. I do not know just exactly how the rotor of your variator is arranged, but I presume it is a full circle or whether it only has 180 degree movement. If it works completely around, I would advise you to turn it around in the opposite direction. The position of this rotor is very important as the second tube will only oscillate when the rotor is in a certain position. As soon as you have it in that position, it sounds something like that of a peanut s and a further adjustment of the rotor or adjustment by means of the condenser C-1 will give you a series of peculiar whistling noise in the telephone.

Eliminating Radiation

Question—A circuit was used for the elimination of radiation? From conversation had with an electrical engineer I was told that some legislation had been enacted prohibiting the use of any, except the particular circuit which would not radiate. I am not sure of the exact what you may take it that the radiation has been caused from the single circuit. Of course, it will be necessary to have the loop pointing toward the station you are receiving from.

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First Aid for the Radio Fan

How the Single Tube Super R. Is Tuned; Double and Single Circuit Radiation; Tuned Radio Frequency Transformers

Question—Relative to the hook-up of Mr. Armstrong's super-regenerative set, using honeycomb coils, will you kindly answer the following questions? 1. Is the hook-up shown correct? 2. The constant tone given out by Mr. Armstrong's set, I believe, had C1 and C2 variable. Will fixed condensers work as well? Mr. M. J. V. 201 has used? If so, is 90 volts all right? With about 100 turns on the coil and 25 turns on the tickler, will there be sufficient inductance? 4. Did Mr. Armstrong use a "C" battery in his hook-up? 5. Will this set receive both phones and code? 6. Using a loop, how many miles do you think I can receive radio broadcasts using this set? 7. Could you give a relative estimate on the tuning of the set?—A. H.

Answer—The diagram is practically O. K. The filter circuit, which is not shown, is not altogether necessary but improves the set somewhat.

1. If one stage of audio-frequency amplification is added to the set, the filter circuit then becomes imperative. The condensers across the two large coils will not be necessary, as they have to be variable in the ordinary sense. Arrangements must be made, however, to vary the capacity in them. This means that fixed condensers can be used, and the variable capacitors can be used, and the capacity varied by adding individual fixed condensers or taking them away.

Coils for Honeycomb Set

Question—I should like very much to obtain information as to the use of honeycomb coils in connection with an electronic detector set. I should like the information as to the number of turns required on the primary, secondary and tertiary coils to give a range of 200 to 400 meters. Also, whether or not the coils can be used in this circuit? If not, what type of coils must be used and the voltage required on both the "A" and "B" batteries?—E. J. L.

Answer—The size of the coils used on the primary will depend a great deal upon the length of the aerial that you use, but I would suggest a 50 turn coil each in the primary and secondary, and a 75 turn coil in the tickler. You can use a UV 201 tube in this circuit, and if you do so, you will need a 6 volt storage battery for the filament and a 22 1/2 volt "B" battery for the plate.

I would suggest the use of a .0005 variable capacitor in series with the primary coil, and another condenser for the same capacity across the secondary coil. This condenser is a conventional 23 plate type. You will have to make up your mind as to their relation to each other, and it may be necessary to reverse the leads on the tickler to make sure of this.

Tuned R. F. Amplification

Question—1. Would you advise the purchase of a tuned transformer circuit? It means that the tuned circuit means you tune to the broadcasting 30-meter wave length. 2. Is the transformer coupled R. F. amplifier more efficient and easier to tune?—J. J. M.

Answer—The radio-frequency transformers do not operate in the same way that audio-frequency transformers function. They are generally used to form the output of one tube to the input of the other, but they also amplify at the same time in radio anywhere from 21 to 111. Radio-frequency transformers, however, merely transfer the output of one tube to the input of the other, relying on the amplifying characteristics of the tube itself to build up the signal. The received signal. Most of these transformers are of a fixed value, arranged to cover a certain wave-length band. A tuned transformer is generally an arrangement to enable you to put your radio-frequency amplifying circuit into closer resonance with the incoming wave and, of course, adds more adjustments to your circuit.

Electrolytic Detector and Amplifiers

Question—Would not an electrolytic detector give less noise in the receiver than a tube using both radio and audio amplification?—P. M. W.

Answer—I have never had any experience with an electrolytic detector hook-up. My vacuum tube set has vacuum tubes, so I could not give you advice on that question at the present time. However, at an early date we hope to undertake some experiments with this type of detector in conjunction with vacuum tubes in the new laboratory that we are installing, and as soon as we are able to do this we will print the results.

How Long Can Phones Be Used?

Question—I have a pair of Brander phones with my Aerialia Senior and I should like to know how long the set for four or five hours continuously would damage the set or the phones? If there is any maximum time limit on the phones please inform me.—A. E. S., Jr.

Answer—There is no time limit on the continuous use of telephones. In fact, some operators have them in operation twenty-four hours of the day without any bad effect. The same is true of the set.

Name of Broadcast Station

Question—Kindly tell me the owner's name and location of radio telephone station WFL, New York City.

Answer—WFL is the station belonging to Strawbridge & Clothier, at Philadelphia.

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New Broadcast Schedule Will Start Monday

Class B Station Authorized by Commerce Department Will Begin Operating on 400 Meter Wave Length

Three in This Locality

WJZ Elects to Stay on 360 Meters on Theory Good Station Needed There

An important change in the broadcasting schedules of the stations in the second radio district goes into effect to-morrow under the ruling of the Department of Commerce which divides such stations into two classes. This ruling creates a new type of broadcast station, which will permit two stations close together to send out programs simultaneously without interference.

Steady Operation Demanded

The power supply must be dependable and non-fluctuating, and the radio set must be capable of delivering between 500 and 1,000 watts to the antenna. This power must be modulated by a system which is capable of giving only the very best quality of sound, the radio frequency current being transmitted in accordance with the sound impressed upon the microphone.

Stare parts and especially vacuum tubes must be available in such quantities as to insure continuity and reliability of the broadcast service. Other specifications relating to the studio and a proper signaling system between the studio and radio operating room must also be met.

British Amateur Meets Ruthless Landlord Rule

Owners of Houses in Albion Unsympathetic Toward the Radio "Flu"

The British weekly "Wireless World" prints the following, which shows England is going through the same cycle of events as this country: "From notes which have recently appeared in the daily press it is apparent that in some instances, the attitude of landlords toward the erection of aerials on buildings will not be an encouraging one. A reasonable attitude for a landlord to adopt would be to obtain an undertaking that any damage resulting from the erection of an aerial would be made good by the tenant. Beyond that it is difficult to see any reason for landlords to interfere."

No Interference Expected

The questions as to whether stations operating on 360 and 400 meters will interfere with each other has received preliminary investigation, and indications thus far obtained lead to the belief that such interference will be very serious. It is expected that all but a few of the receiving sets in the metropolitan area will be able to satisfactorily tune to either one or the other of these stations and eliminating the one which it is not desired to listen to.

The stations WFL and WBAI will not work simultaneously, but one of the other will operate according to local circumstances, on the time allotted to both conjointly.

Joint Operation of Stations

The joint operation of these two stations is a matter of special interest to the telephone circuit joining them together. The programs will all be produced in the studio of WBAI, and according to circumstances may be radiated directly by its radio equipment, or

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